

Amendments to the Claims

Claim 1 (Previously Presented) An optical transmission system comprising:

a transmitter for transmitting an optical signal toward a multi-mode fiber having an input plane with a core diameter, said transmitter including:

a light emission element for generating an optical signal; and

at least one lens having an optical axis and a vertex for converging the optical signal generated by said light emission element, wherein

the optical signal converged by said at least one lens enters the input plane of the multi-mode fiber to propagate through the multi-mode fiber,

the optical axis is aligned with a fiber axis of the multi-mode fiber,

the vertex is located at a predetermined distance from the input plane of the multi-mode fiber,

the predetermined distance is greater or less than a distance from the vertex to a focal point of said at least one lens,

an incident light propagation cross-section of the optical signal is defined in a plane perpendicular to the optical axis at the predetermined distance from the vertex, and

a distance between the focal point and the input plane is such that the incident light propagation cross-section is greater than a core cross-section defined by the core diameter at the input plane; and

a receiver including a light receiving element for receiving the optical signal outputted from the multi-mode fiber.

Claim 2 (Previously Presented) The optical transmission system according to claim 1, wherein the input plane of the multi-mode fiber is placed at a position farther away from said at least one lens than the focal point of said at least one lens.

Claim 3 (Previously Presented) A transmitter for outputting an optical signal toward a multi-mode fiber having an input plane with a core diameter, the transmitter comprising:

a light emission element for generating an optical signal; and

at least one lens having an optical axis and a vertex for converging the optical signal generated by said light emission element, wherein

the optical signal converged by said at least one lens enters the input plane of the multi-mode fiber to propagate through the multi-mode fiber,

the optical axis is aligned with a fiber axis of the multi-mode fiber,

the vertex is located at a predetermined distance from the input plane of the multi-mode fiber,

the predetermined distance is greater or less than a distance from the vertex to a focal point of said at least one lens,

an incident light propagation cross-section of the optical signal is defined in a plane perpendicular to the optical axis at the predetermined distance from the vertex, and

a distance between the focal point and the input plane is such that the incident light propagation cross-section is greater than a core cross-section defined by the core diameter at the input plane.

Claim 4 (Previously Presented) The transmitter according to claim 3, wherein the input plane of the multi-mode fiber is placed at a position farther away from said at least one lens than the focal point of said at least one lens.

Claim 5 (Previously Presented) The transmitter according to claim 3, further comprising a receptacle for connecting to the multi-mode fiber to affix the input plane of the multi-mode fiber at a position other than the focal point of said at least one lens.

Claim 6 (Currently Amended) An optical transmission system comprising:

a transmitter for transmitting an optical signal through a multi-mode fiber including:

a light emission element for generating an optical signal; and

at least one lens having an optical axis and a vertex for converging the optical signal generated by said light emission element,

wherein the optical signal converged by said at least one lens enters an input plane of the multi-mode fiber, propagates through the multi-mode fiber, and is outputted from an output plane of the multi-mode fiber; and

a receiver including:

a light receiving element having a light-receiving plane for receiving the optical signal from the output plane of the multi-mode fiber; and

a receptacle for connecting to the multi-mode fiber to affix the output plane of the multi-mode fiber at a predetermined distance from the light-receiving plane, wherein

said light receiving element receives a lower order mode of the optical signal and a higher order mode is prevented from entering the light-receiving plane of said light receiving element,~~and~~

the predetermined distance is determined based on a core diameter of the multi-mode fiber, a diameter of the light-receiving plane, and a maximum angle among angles of modes of the optical signal outputted from the output plane of the multi-mode fiber which are capable of entering the light-receiving plane, so that a numerical aperture-~~number~~ of the light-receiving plane is equal to or less than a given value, and

the given value is greater than zero and less than one.

Claim 7 (Previously Presented) The optical transmission system according to claim 6, wherein said light receiving element is a Si PIN photodiode.

Claim 8 (Currently Amended) A receiver for receiving an optical signal outputted from a multi-mode fiber, the receiver comprising:

a light receiving element having a light-receiving plane for receiving the optical signal from an output plane of the multi-mode fiber; and

a receptacle for connecting to the multi-mode fiber to affix the output plane of the multi-mode fiber at a predetermined distance from the light-receiving plane, wherein

said light receiving element receives a lower order mode of the optical signal and a higher order mode is prevented from entering the light-receiving plane of said light receiving element,~~and~~

the predetermined distance is determined based on a core diameter of the multi-mode fiber, a diameter of the light-receiving plane, and a maximum angle among angles of modes of the optical signal outputted from the output plane of the multi-mode fiber which are capable of entering the light-receiving plane, so that a numerical aperture~~number~~ of the light-receiving plane is equal to or less than a given value, and
the given value is greater than zero and less than one.

Claim 9 (Currently Amended) An optical transmission system comprising:

a transmitter for transmission an optical signal through a multi-mode fiber, said transmitter including:

a light emission element for generating an optical signal; and

at least one lens having an optical axis and a vertex for converging the optical signal generated by said light emission element, wherein

the optical signal converged by said at least one lens enters an input plane of the multi-mode fiber, propagates through the multi-mode fiber, and is outputted from an output plane of the multi-mode fiber,

the optical axis is aligned with a fiber axis of the multi-mode fiber,

the vertex is located at a first predetermined distance from the input plane of the multi-mode fiber,

the first predetermined distance is greater or less than a distance from the vertex of said at least one lens to a focal point of said at least one lens, and

the first predetermined distance is determined based on an eye opening factor of the multi-mode fiber and a power of the optical signal, so that a numerical aperture is equal to or less than a first given value and the power of the optical signal is equal to or greater than a second given value; and

a receiver including:

a light receiving element having a light-receiving plane for receiving the optical signal from the output plane of the multi-mode fiber; and

a receptacle for connecting to the multi-mode fiber to affix the output plane of the multi-mode fiber at a second predetermined distance from the light-receiving plane, wherein

said light receiving element receives a lower order mode of the optical signal and a higher order mode is prevented from entering the light-receiving plane of said light receiving element, and

the second predetermined distance is determined based on a core diameter of the multi-mode fiber, a diameter of the light-receiving plane, and a maximum angle among angles of modes of the optical signal outputted from the output plane of the multi-mode fiber which are capable of entering the light-receiving plane, so that a numerical aperture of the light-receiving plane is equal to or less than a third given value,

the first and third given values are greater than zero and less than one, and

the second given value is greater than zero.

Claim 10 (Previously Presented) The optical transmission system according to claim 9, wherein the input plane of the multi-mode fiber is placed at a position farther away from a vertex of said at least one lens than the focal point of said at least one lens.

Claim 11 (Previously Presented) The optical transmission system according to claim 9, wherein said light receiving element is a Si PIN photodiode.